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TITLE: Fabric conditioning and cleaning system

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According to the teachings of the present invention, a fluid is directed under pressure through an elongated restricted opening positioned adjacent to a generally smoothly curved fluid flow attachment surface. The surface defines an extended nip with a fabric, and the fabric and surface also form a restricted and diminishing passageway leading to the nip. The fluid attaches itself to the surface due to the Coanda effect and follows the contours thereof into the passageway toward the nip. This fluid movement creates pressure differentials at the fabric and these differentials cause fluid to pass through the fabric, thereby removing foreign matter from the fabric and conditioning the fabric.

FIG. 2 is a schematic elevational view of an alternative form of Coanda nozzle which may be utilized to practice the present invention.

A web cleaner device, designated generally by reference numeral 16, is positioned along the predetermined path of movement of the felt and closely adjacent thereto. Device 16 includes a Coanda nozzle 18 having a foil 20. As may be clearly seen with reference to FIG. 1, the foil extends at right angles to the direction of fabric movement and includes a generally smoothly curved surface 22 for defining an extended nip with the foraminous web. Said nip need

not necessarily be a closed nip. The present invention is operational even when the nip is slightly open.

Also comprising a portion of the Coanda nozzle 18 is a bracket 26 having a leg element 28. The free terminal end of leg element 28 defines with the foil 20 an elongated restricted opening in the form of a slit. The slit has a generally uniform width along its length lying within the range of from about 0.002 inches to about 0.005 inches. The width of the slit may be adjusted by means of a plurality of screws 29 positioned at space intervals along the length of leg element 28 and cooperating with lock nuts 31.

A conduit 36 leads from the Coanda nozzle 18 to a supply header 38 which is filled with pressurized steam or other suitable cleaning fluid. It will be appreciated that the pressurized fluid will pass downwardly through the interior of conduit 36 and into pressurized chamber 32 through passageways 33 and 35 formed in foil 20. In the practice of the present invention it is preferred that steam be utilized as the cleaning agent.

According to the method of the present invention, the steam is directed under pressure through the slit, preferably at a pressure within the range of from about 20 psig to about 60 psig. The fluid flow, due to the Coanda effect, attaches itself to the generally smoothly curved Coanda fluid attachment surface adjacent to the slit. The fluid then flows along the curvature of the surface away from the slit and enters restricted and diminishing passageway 24.

It has been found that operational effectiveness is increased by moving the foraminous web relative to surface 22 in a direction generally opposed to the direction of movement of the fluid flow in the passageway.

To enhance cleaning, sometimes it may be desirable to spray a mixture of water and detergent onto the fabric prior to its passage past the Coanda nozzle 18. In FIG. 1, a spray nozzle 42 for accomplishing this objective is illustrated in schematic fashion.

1. A method of cleaning and conditioning a fabric with pressurized fluid from a Coanda nozzle comprising: positioning a generally smoothly curved Coanda fluid flow attachment foil surface adjacent to a slit defining element to form an elongated slit; directing said fluid in a predetermined direction under pressure through said slit whereby fluid attaches to said foil surface after passage through said slit and whereby said fluid deviates from the predetermined direction and flows along the curvature of said surface due to the Coanda effect away from said slit and ambient air is entrained with said fluid as the fluid flows along the curvature of the foil surface; disposing said fabric closely adjacent to said foil surface and in registry with at least a portion of said surface whereby said fabric and said surface define a restricted and diminishing passageway terminating at an extended nip between said fabric and said surface; moving said fabric relative to said surface and in a path of movement spaced away from said slit and generally at right angles thereto; directing the combined fluid and ambient air flow into said passageway along said foil surface toward said extended nip and thereby creating pressure differentials at said fabric in the vicinity of said nip and passageway with said fluid and ambient air; and utilizing the pressure differentials created by said fluid and ambient air to condition said fabric and remove foreign matter from said fabric.

during said fabric movement bringing said fabric into close proximity with a Coanda nozzle having a foil defining a generally smoothly curved Coanda fluid flow attachment surface and a slit defining element spaced from said fluid flow attachment surface and extending across at least part of the width of said fabric;

directing a fluid in a predetermined direction under pressure through a slit defined by the surface of said foil and said slit defining element and spaced from said fabric and generally at right angles thereto and engaging said fluid with said Coanda fluid flow attachment surface;

utilizing the Coanda effect to attach the fluid to said Coanda fluid flow attachment surface of said foil while substantially simultaneously entraining ambient air with said fluid; and

directing the combined flow of pressurized fluid and ambient air into said passageway along said Coanda fluid flow attachment surface toward said nip whereby said fluid and said ambient air create pressure differentials at said fabric in the vicinity of said passageway and nip; and

a Coanda nozzle positioned along said predetermined path of movement and closely adjacent to said fabric, said Coanda nozzle extending generally at right angles to the direction of fabric movement and in at least partial registration with said fabric, said Coanda nozzle including a generally smoothly curved Coanda fluid flow attachment foil surface for defining an extended nip with said fabric and for further defining with said fabric a restricted and diminishing passageway terminating at said nip and communicating with ambient air, said Coanda nozzle additionally including

a slit defining element defining an elongated slit with said generally smoothly curved Coanda fluid flow attachment foil surface generally at right angles to said fabric and spaced from said fabric, said slit defining element and said generally smoothly curved Coanda fluid flow attachment surface cooperable to direct pressurized fluid exiting from said slit and ambient air entrained thereby along said surface due to the Coanda effect whereby pressure differentials will be created at the fabric in the vicinity of said passageway and nip by the combined fluid and ambient air and at least a portion of said fluid will be forced through said fabric to expel foreign matter therefrom.

17. The combination of claim 12 wherein said slit defining means comprises said generally smoothly curved Coanda fluid flow attachment surface and a slit defining element adjustable relative to said surface to selectively vary the width of said slit.